



## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 39**

**[Docket No. FAA-2022-1240; Project Identifier AD-2022-00683-E]**

**RIN 2120-AA64**

#### **Airworthiness Directives; General Electric Company Turbofan Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FAA proposes to adopt a new airworthiness directive (AD) for certain General Electric Company (GE) GE90-76B, GE90-85B, GE90-90B, and GE90-94B model turbofan engines. This proposed AD was prompted by a commanded in-flight shutdown (IFSD) due to cracking and rockback of the high-pressure turbine (HPT) stage 2 nozzles resulting in blade liberation, severe rotor imbalance, and liberation of the exhaust centerbody. This proposed AD would require initial and repetitive borescope inspections (BSIs) of the forward platforms of the HPT stage 2 blades or the leading edges of the HPT stage 2 nozzles and, depending on the results of the inspections, removal and replacement of the HPT stage 2 nozzles with a part eligible for installation. As a mandatory terminating action to the repetitive BSIs of the forward platforms of the HPT stage 2 blades or the leading edges of the HPT stage 2 nozzles, this proposed AD would require replacement of the HPT stage 2 nozzles. The FAA is proposing this AD to address the unsafe condition on these products.

**DATES:** The FAA must receive comments on this proposed AD by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to [regulations.gov](https://www.regulations.gov). Follow the instructions for submitting comments.
- Fax: (202) 493-2251.



- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

*AD Docket:* You may examine the AD docket at [regulations.gov](https://www.regulations.gov) by searching for and locating Docket No. FAA-2022-1240; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this NPRM, any comments received, and other information. The street address for Docket Operations is listed above.

*Material Incorporated by Reference:* For service information identified in this NPRM, contact General Electric Company, GE Aviation, Room 285, 1 Neumann Way, Cincinnati, OH 45215; phone: (513) 552-3272; email: [aviation.fleetsupport@ge.com](mailto:aviation.fleetsupport@ge.com). You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA, 01803. For information on the availability of this material at the FAA, call (817) 222-5110.

**FOR FURTHER INFORMATION CONTACT:** Stephen Elwin, Aviation Safety Engineer, ECO Branch, FAA, 1200 District Avenue, Burlington, MA 01803; phone: (781) 238-7236; email: [Stephen.L.Elwin@faa.gov](mailto:Stephen.L.Elwin@faa.gov).

**SUPPLEMENTARY INFORMATION:**

**Comments Invited**

The FAA invites you to send any written relevant data, views, or arguments about this proposal. Send your comments to an address listed under ADDRESSES. Include “Docket No. FAA-2022-1240; Project Identifier AD-2022-00683-E” at the beginning of your comments. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend this proposal because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all



comments received, without change, to regulations.gov, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this NPRM.

### **Confidential Business Information**

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this NPRM contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this NPRM, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as "PROPIN." The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this NPRM. Submissions containing CBI should be sent to Stephen Elwin, Aviation Safety Engineer, ECO Branch, FAA, 1200 District Avenue, Burlington, MA 01803. Any commentary that the FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

### **Background**

The FAA received a report of a commanded IFSD of a GE90-85B model turbofan engine installed on a Boeing Model 777-200ER airplane that occurred on July 12, 2018. Subsequent investigation by the manufacturer found that cracking and rockback of the HPT stage 2 nozzles, due to thermal distress in the fillet radius of the leading edge, resulted in rotor-stator contact with the HPT stage 2 blade platform. This condition caused liberation of an HPT stage 2 blade and severe rotor imbalance, leading to liberation of the exhaust centerbody from the engine. This condition, if not addressed, could result in IFSD, failure of the engine and exhaust centerbody, and loss of the airplane.

### **FAA's Determination**

The FAA is issuing this NPRM after determining that the unsafe condition described previously is likely to exist or develop on other products of the same type design.



## **Related Service Information under 1 CFR Part 51**

The FAA reviewed GE GE90 Service Bulletin (SB) 72-1166, Revision 3, dated February 14, 2019. This service information specifies procedures for BSIs of the HPT stage 2 blade forward platforms for rub marks or evidence of contact (circumferential grooves on the HPT stage 2 blade platforms) with the HPT stage 2 nozzle angel wings. This service information also specifies procedures for performing a 360-degree BSI of the HPT stage 2 nozzles leading edges and specifies procedures for removal and replacement of HPT stage 2 nozzles.

This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in ADDRESSES.

## **Other Related Service Information**

The FAA reviewed GE GE90 SB 72-1071, Revision 1, dated January 16, 2015. This service information specifies procedures for removal and replacement of HPT stage 2 nozzles with HPT stage 2 nozzles that incorporate a design change.

The FAA also reviewed GE GE90 SB 72-1216, Initial Issue, dated August 22, 2022. This service information specifies inspection procedures for affected HPT stage 2 nozzles.

## **Proposed AD Requirements in this NPRM**

This proposed AD would require initial and repetitive borescope inspections of the forward platforms of the HPT stage 2 blades or the leading edges of the HPT stage 2 nozzles and, depending on the results of the inspections, removal and replacement of the HPT stage 2 nozzles with parts eligible for installation. As a mandatory terminating action to the repetitive BSIs of the forward platforms of the HPT stage 2 blades or the leading edges of the HPT stage 2 nozzles, this proposed AD would require replacement of the HPT stage 2 nozzles.

## **Differences Between this Proposed AD and the Service Information**

GE GE90 SB 72-1166, Revision 3, dated February 14, 2019, specifies BSIs be performed upon reaching the threshold of the analytical model for the HPT stage 2 nozzles after GE Aviation issues a customer notification report for any engine that



reaches the analytical threshold, while this proposed AD would require that BSIs be performed based on the flight hours accrued on the HPT stage 2 nozzles since new or since overhaul.

### **Costs of Compliance**

The FAA estimates that this AD, if adopted as proposed, would affect 8 engines installed on airplanes of U.S. registry.

The FAA estimates the following costs to comply with this proposed AD:

#### **Estimated costs**

<b>Action</b>	<b>Labor Cost</b>	<b>Parts Cost</b>	<b>Cost per product</b>	<b>Cost on U.S. operators</b>
BSI of HPT stage 2 nozzles or HPT stage 2 blade interface	4 work-hours x \$85 per hour = \$340	\$0	\$340	\$2,720

The FAA estimates the following costs to do any necessary replacements that would be required based on the results of the proposed inspections. The agency has no way of determining the number of aircraft that might need these replacements.

#### **On-condition costs**

<b>Action</b>	<b>Labor Cost</b>	<b>Parts Cost</b>	<b>Cost per product</b>
Replace full set of HPT stage 2 nozzles	8 work-hours x \$85 per hour = \$680	\$918,650	\$919,330

### **Authority for this Rulemaking**

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds



necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

### **Regulatory Findings**

The FAA determined that this proposed AD would not have federalism implications under Executive Order 13132. This proposed AD would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify this proposed regulation:

- (1) Is not a “significant regulatory action” under Executive Order 12866,
- (2) Would not affect intrastate aviation in Alaska, and
- (3) Would not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

### **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

### **The Proposed Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA proposes to amend 14 CFR part 39 as follows:

#### **PART 39 - AIRWORTHINESS DIRECTIVES**

- 1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

#### **§ 39.13 [Amended]**

- 2. The FAA amends § 39.13 by adding the following new airworthiness directive:

**General Electric Company:** Docket No. FAA-2022-1240; Project Identifier AD-2022-00683-E.

#### **(a) Comments Due Date**

The FAA must receive comments on this airworthiness directive (AD) by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].



**(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to General Electric Company (GE) GE90-76B, GE90-85B, GE90-90B, and GE90-94B model turbofan engines, excluding those engines with an installed full set of high-pressure turbine (HPT) stage 2 nozzles with part numbers 1847M47G23 and 1847M47G24.

**(d) Subject**

Joint Aircraft System Component (JASC) Code 7250, Turbine Section.

**(e) Unsafe Condition**

This AD was prompted by a commanded in-flight shutdown (IFSD) due to cracking and rockback of the HPT stage 2 nozzles resulting in blade liberation, severe rotor imbalance, and liberation of the exhaust centerbody. The FAA is issuing this AD to prevent failure of the HPT stage 2 nozzles, HPT stage 2 blades, and exhaust centerbody. The unsafe condition, if not addressed, could result in IFSD, failure of the engine and exhaust centerbody, and loss of the airplane.

**(f) Compliance**

Comply with this AD within the compliance times specified, unless already done.

**(g) Required Actions**

(1) Within the compliance times specified in paragraphs (g)(1)(i) and (ii) of this AD, perform an initial borescope inspection (BSI) of the forward platforms of the HPT stage 2 blades, or perform a 360 degree BSI of the leading edges of the HPT stage 2 nozzles (optional procedure) in accordance with the Accomplishment Instructions, paragraph 3.A.(3)(a) of GE GE90 SB 72-1166, Revision 3, dated February 14, 2019 (the SB):

(i) For engines with HPT stage 2 nozzles that have accumulated 22,000 or more flight hours since new or since last overhaul as of the effective date of this AD, perform the initial BSI before accumulating 250 flight cycles (FCs) after the effective date of this AD.



(ii) For engines with HPT stage 2 nozzles that have accumulated less than 22,000 flight hours since new or since last overhaul as of the effective date of this AD, perform the initial BSI before accumulating 22,000 flight hours since new or since last overhaul, or within 250 FCs after the effective date of this AD, whichever occurs later.

(2) Thereafter, at intervals not to exceed 100 FCs from performance of the last BSI of the forward platforms of the HPT stage 2 blades, or at intervals not to exceed 500 FCs from the last BSI of the leading edges of the HPT stage 2 nozzles, as applicable, perform a repetitive BSI of the forward platforms of the HPT stage 2 blades or the leading edges of the HPT stage 2 nozzles in accordance with the Accomplishment Instructions, paragraph 3.A.(3)(a) of the SB.

(3) If, during any inspection required by paragraphs (g)(1) or (g)(2) of this AD, rub marks, evidence of contact on the HPT stage 2 blade forward platform on three or more HPT stage 2 blades, or an unserviceable HPT stage 2 nozzle is found, before further flight, remove and replace the HPT stage 2 nozzles with a part eligible for installation.

NOTE 1 to paragraph (g)(3): Serviceability criteria can be found in the GE90 Boeing 777 Aircraft Maintenance Manual, 72-00-00, INSPECTION/CHECK, Subtask 72-00-00-220-074-G00.

#### **(h) Mandatory Terminating Action**

As a mandatory terminating action to the repetitive inspections required by paragraph (g)(2) of this AD, at the next engine shop visit after reaching 22,000 flight hours since new or since last overhaul, replace the HPT stage 2 nozzles with parts eligible for installation.

#### **(i) Definitions**

(1) For the purpose of this AD, “parts eligible for installation” is a full set of HPT stage 2 nozzles with part numbers 1847M47G23 and 1847M47G24.

(2) For the purpose of this AD, an “overhaul” is the complete refurbishment of the HPT stage 2 nozzle segments.

(3) For the purpose of this AD, and “engine shop visit” is the induction of an engine into the shop for maintenance involving separation of pairs of major mating engine case flanges, except for the following situations, which do not constitute an engine



shop visit:

(i) Separation of engine flanges solely for the purposes of transportation of the engine without subsequent maintenance; or

(ii) Separation of engine flanges solely for the purpose of replacing the fan or propulsor without subsequent maintenance.

**(j) Credit for Previous Actions**

You may take credit for the initial inspection required by paragraph (g)(1) of this AD if you performed the inspection before the effective date of this AD using GE GE90 SB 72-1166, Revision 2, dated October 13, 2017, or earlier revisions.

**(k) Alternative Methods of Compliance (AMOCs)**

(1) The Manager, ECO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (l)(1) of this AD. Information may be emailed to: ANE-AD-AMOC@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

**(l) Related Information**

(1) For more information about this AD, contact Stephen Elwin, Aviation Safety Engineer, ECO Branch, FAA, 1200 District Avenue, Burlington, MA 01803; phone: (781) 238-7236; email: Stephen.L.Elwin@faa.gov.

(2) GE service information identified in this AD that is not incorporated by reference is available at the addresses specified in paragraph (m)(3) of this AD.

**(m) Material Incorporated by Reference**

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.



(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) GE GE90 Service Bulletin (SB) 72-1166, Revision 3, dated February 14, 2019.

(ii) [Reserved]

(3) For GE service information identified in this AD, contact General Electric Company, GE Aviation, Room 285, 1 Neumann Way, Cincinnati, OH 45215; phone: (513) 552-3272; email: [aviation.fleetsupport@ge.com](mailto:aviation.fleetsupport@ge.com).

(4) You may view this service information at FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA, 01803. For information on the availability of this material at the FAA, call (817) 222-5110.

(5) You may view this service information that is incorporated by reference at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email: [fr.inspection@nara.gov](mailto:fr.inspection@nara.gov), or go to: [www.archives.gov/federal-register/cfr/ibr-locations.html](http://www.archives.gov/federal-register/cfr/ibr-locations.html).

Issued on September 26, 2022.

Christina Underwood, Acting Director,  
Compliance & Airworthiness Division,  
Aircraft Certification Service.

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